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The decline in Arctic summer sea ice

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The extent of Arctic sea ice has been decreasing since the late 1970s. In 2007 it decreased dramatically in a single year, reaching an all-time low. At the time it was widely reported that this was caused by man-made climate change and that the rate of decline of summer sea ice was increasing.

Modelling of Arctic sea ice by the Met Office Hadley Centre climate model shows that ice invariably recovers from extreme events, and that the long-term trend of reduction is robust — with the first ice-free summer expected to occur between 2060 and 2080. It is unlikely that the Arctic will experience ice-free summers by 2020.

Analysis of the 2007 summer sea-ice minimum has subsequently shown that this was due, in part, to unusual weather patterns. Arctic weather systems are highly variable year-on-year and the prevailing winds can enhance, or oppose, the southward flow of ice into the Atlantic. Consequently, the sea ice has not declined every year, but has shown considerable variability — both in extent and thickness.

The high variability has made it difficult to attribute the observed trend to man-made emissions of greenhouse gases, although there is now enough data to detect a human signal in the 30-year trend. The trend and observed variability, including the minimum extent observed in 2007, is consistent with climate modelling from the Met Office.

About half of the climate models involved in the Intergovernmental Panel on Climate Change fourth assessment report, show that ice declines in steps — failing to recover from extreme years. The observed temporary recovery from the 2007 minimum in 2008 and 2009 indicates that the Arctic ice has not yet reached a tipping point, if such exists. We expect Arctic ice to continue to decline in line with increasing global temperatures. If the rate of global temperature rise increases then so will the rate of Arctic sea-ice decline.

Explorer Pen Hadow talks about climate change and the Arctic